



STUD	ENTI	D NO	

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

THN 3221 - HIGH SPEED NETWORKS

(All sections / Groups)

15 October 2018 2.30 pm – 4.30 pm (2 Hours)

INSTRUCTIONS TO STUDENTS

- 1. This question paper consists of 4 printed pages (including cover page) with 5 questions only.
- 2. Attempt **ALL Questions**. All Questions carry equal marks (10 marks). The distribution of the marks for each question is given.
- 3. Please print all your answers in the answer booklet provided.

QUESTION 1 [4+3+3 marks]

- (a) Define the following terms
 - i. Propagation Delay
 - ii. Processing Delay
- (b) Elaborate **THREE** components in protocol where protocol is defined as "set of rules or conventions to exchange blocks of formatted data".
- (c) List THREE advantages of packet switching over circuit switching.

QUESTION 2 [7+2+1 marks]

(a) Define the following parameters for a switching network:

N = number of hops between two given end systems

L = message length in bits

B = data rate, in bits per second (bps), on all links

P = fixed packet size, in bits

H = overhead (header) bits per packet

S = call setup time (circuit switching or virtual circuit) in seconds

D = propagation delay per hop in seconds

For N=2, L=4800, B=9600, P=1024, H=16, S=0.3, D=0.002, compute the end-to-end delay for circuit switching and datagram packet switching. Assume that there are no acknowledgments. Ignore processing delay at the nodes.

- (b) List any TWO operations in Switched Virtual Circuits (SVC).
- (c) Define Committed Burst Size.

QUESTION 3 [5+3+2 marks]

- (a) A check-in counter at has the mean arrival rate at 5 guests per 30 minutes and the mean service rate is 8 guests per 30 minutes.
 - i. What is the average number of guests waiting?
- ii. What is the mean number of guests waiting and being served?

iii. What is the average waiting time?

iv. What is the average time a guest spends in the process of check in?

v. What is the probability that the service facility is idle?

Continued.....

- (b) Consider a LAN with 50 personal computers and a server. The average time for the server to respond to a query is 0.3 seconds and at peak times, the query rate over the LAN reaches 30 queries per minute. Assume it is a M/M/1 model.
 - i. What is the network utilization?
 - ii. What is the average residence time ignoring line overhead?
- (c) How a packet is handled in Multiprotocol Label Switching (MPLS) network?

QUESTION 4 [5+3+2 marks]

- (a) Draw a diagram to show following congestion control mechanisms
 - i. Policing
 - ii. Choke packet
- iii. Backpressure
- iv. Implicit congestion signaling
- v. Explicit congestion signaling
- (b) Describe Voice over Internet Protocol (VoIP).
- (c) What is fast retransmission rule?

QUESTION 5 [4+4+2 marks]

- (a) List FOUR advantages of Software Defined Network (SDN).
- (b) Give a 5G network case study that related to new trends in networking.
- (c) Describe software defined wide area network.

APPENDIX

λ = arrival rate: mean number of arrivals per second

T_s = mean service time for each arrival; amount of time being served, not counting time waiting in the queue

 σ_{Ts} = standard deviation of service time

ρ = utilization; fraction of time facility (server or servers) is busy

u = traffic intensity

r = mean number of items in system, waiting and being served (residence time)

R = mumber of items in system, waiting and being served

 T_r = mean time an item spends in system (residence time)

 T_R = time an item spends in system (residence time)

 $\sigma_r = \text{standard deviation of } r$

 σ_D = standard deviation of T_p

w = mean number of items waiting to be served

 σ_{w} = standard deviation of w

 T_w = mean waiting time (including items that have to wait and items with waiting time = 0)

 $T_{\hat{a}}$ = mean waiting time for items that have to wait

N = number of servers

 $m_X(v)$ = the jth percentile; that value of j below which x occurs y percent of the time

	General	Single Server
; *	= λT_r Little's formula	$\rho = \lambda T_s$
ļi'	= λT_W Little's formula	$r = w + \rho$
$T_{I'}$	$= T_{11} + T_{5}$	r

Exponential Service Times (M/M/I)

$$r = \frac{\rho}{1 - \rho} \qquad w = \frac{\rho^{2}}{1 - \rho}$$

$$T_{r} = \frac{T_{c}}{1 - \rho} \qquad T_{w} = \frac{\rho T_{c}}{1 - \rho}$$

$$\sigma_{r} = \frac{\sqrt{\rho}}{1 - \rho} \qquad \sigma_{fr} = \frac{T_{c}}{1 - \rho}$$

$$\Pr[R = N] = (1 - \rho)\rho^{w} \qquad m_{f}(y) = \frac{\ln\left(1 - \frac{y}{100}\right)}{\ln\rho} - 1$$